

ADVANCES in STEMI CARE

Task Force Meeting

January 15, 2008

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St. John's Mercy Heart Hospital
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Epidemiology of ACS in the United States

- Single largest cause of death
 - 515,204 US deaths in 2000
 - 1 in every 5 US deaths
- Incidence
 - 1,100,000 Americans will have a new or recurrent coronary attack each year and about 45% will die*
 - 550,000 new cases of angina per year
- Prevalence
 - 12,900,000 with a history of MI, angina, or both

* Based on data from the ARIC study of the National Heart, Lung, and Blood Institute, 1987-1994. Includes Americans hospitalized with definite or probable MI or fatal CHD, not including silent MIs. ACS indicates acute coronary syndrome; MI, myocardial infarction; ARIC, Atherosclerotic Risk in Communities; and CHD, coronary heart disease. From American Heart Association. *Heart Disease and Stroke Statistics—2003 Update*.

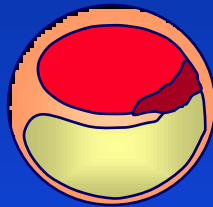
Heart Disease in Missouri

- Prevalence and Incidence
 - Over 220,000 adults report a previous MI
 - Increases significantly with age
 - 15.6% of these adults are age 65 and older
 - 15,4000 MI hospitalizations each year 1994-2005
- Mortality
 - Diseases of the heart leading cause of death
 - Underlying cause of 26.9% of all death
 - 40 deaths each day, 14 from MI

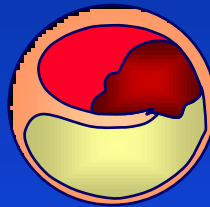
Thrombus Formation and ACS

Plaque Disruption/Fissure/Erosion

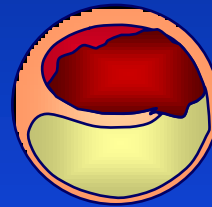
Thrombus Formation



UA



NQMI



STE-MI

Old
Terminology:

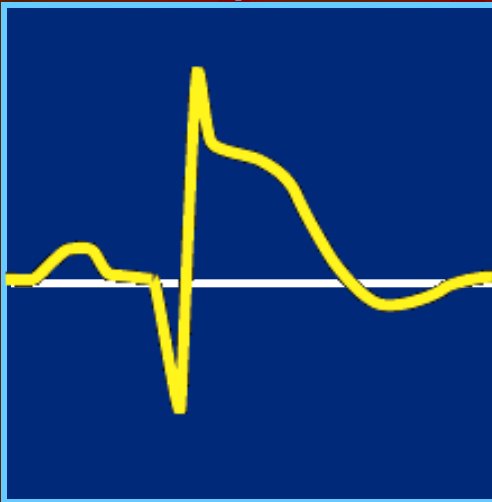
New
Terminology:

Non-ST-Segment Elevation Acute
Coronary Syndrome (ACS)

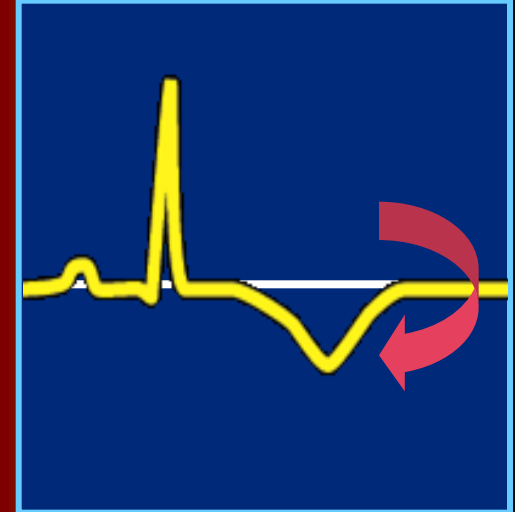
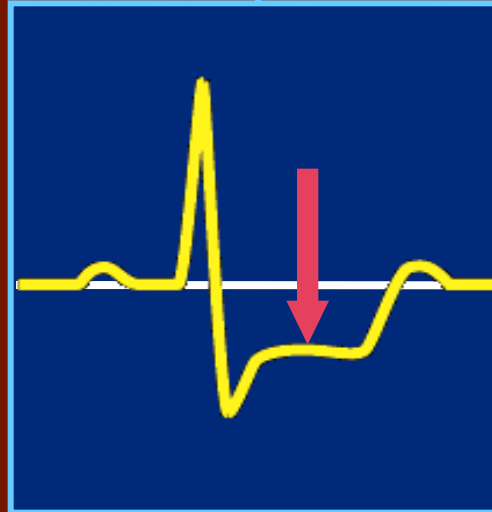
ST-Segment
Elevation
Acute
Coronary
Syndrome
(ACS)

Annual Admissions for Acute Coronary Syndrome (ACS)

**~ 2.0 MM patients admitted
to CCU or telemetry annually**

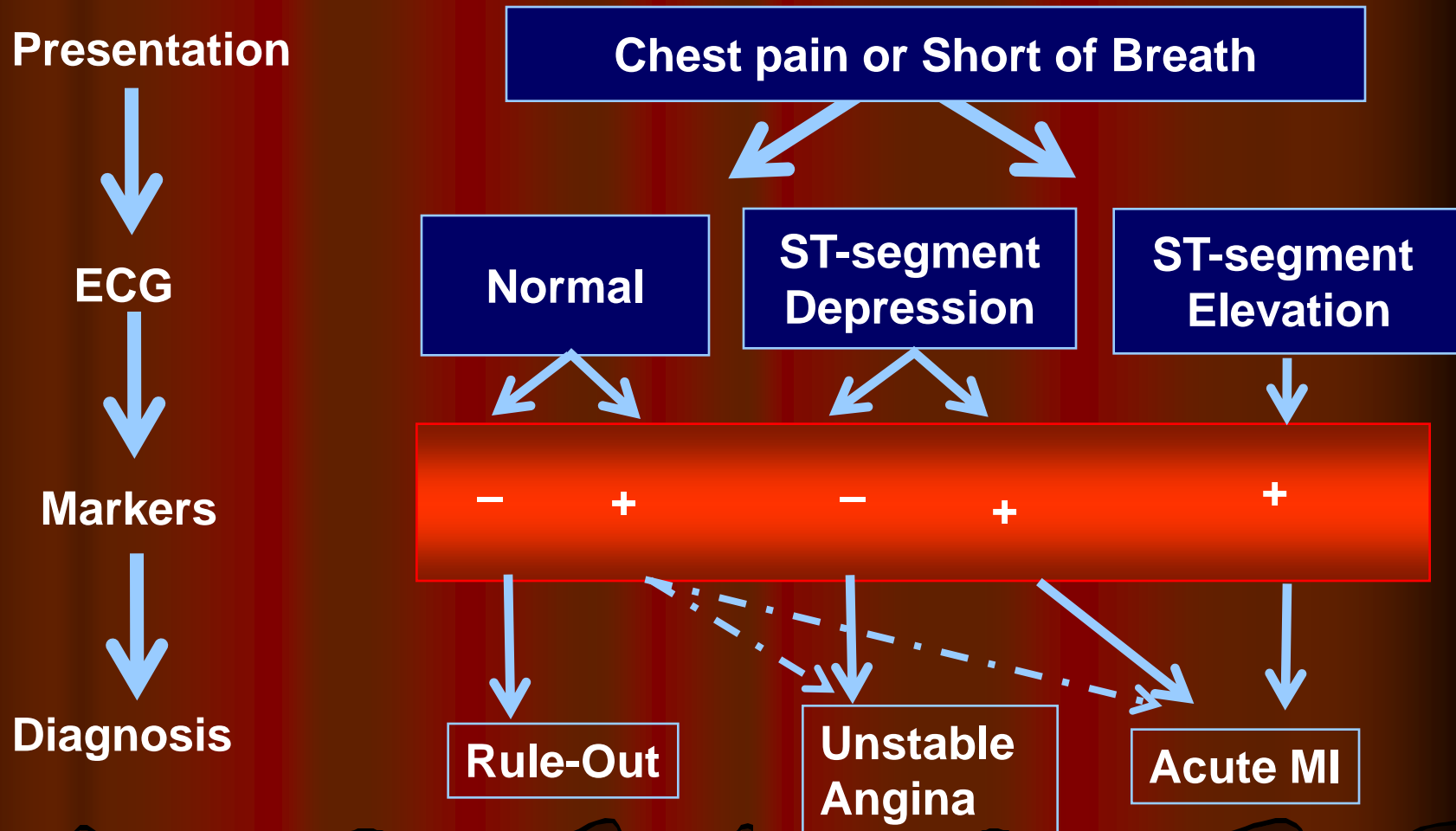


**600,000
ST-segment
elevation MI**



**1.4 Million
Non-ST-segment
elevation ACS
AND GROWING!**

Time Dependent: Emergency Evaluation of ACS





Editorial

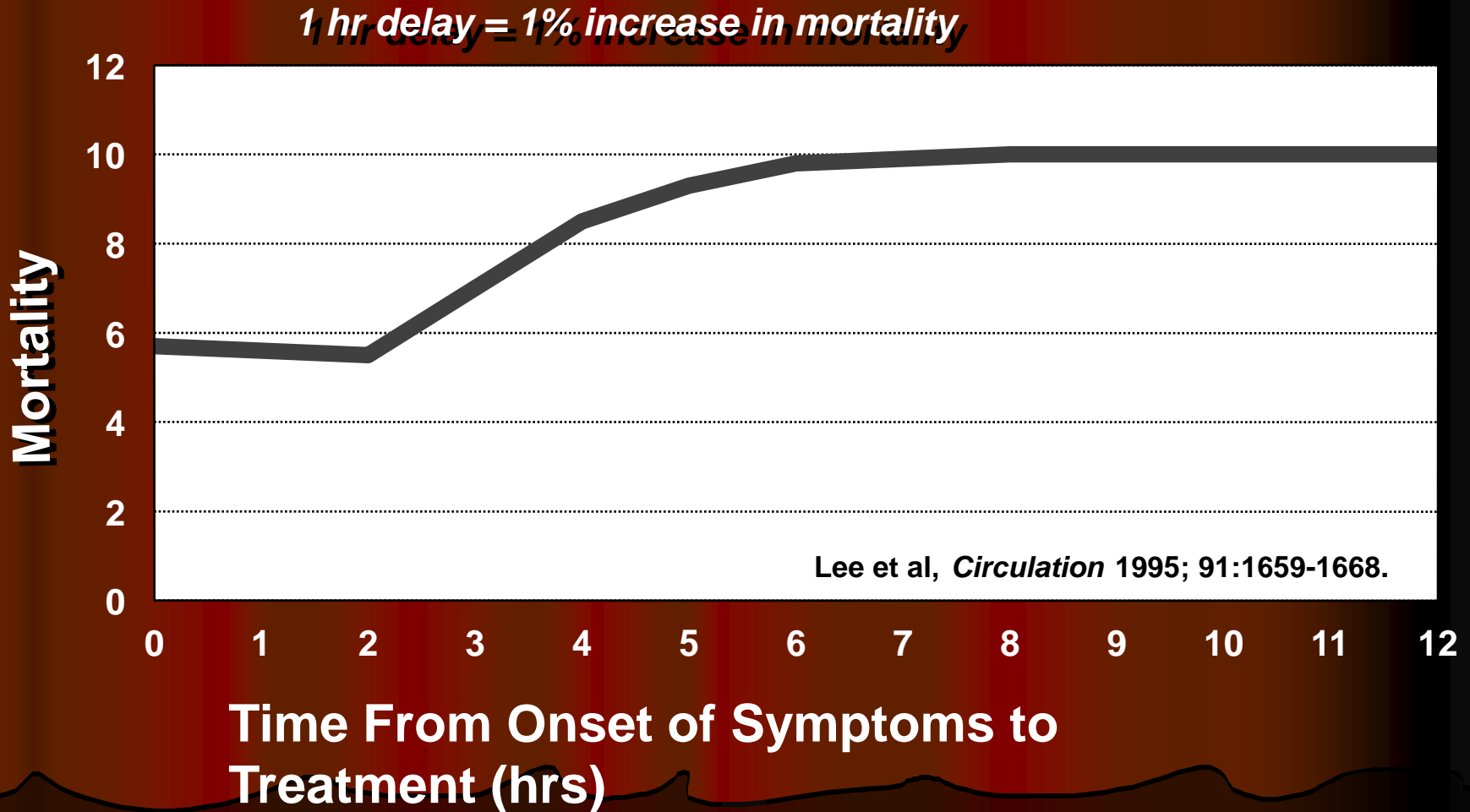
Time Is Myocardium and Time Is Outcomes

C. Michael Gibson, MS, MD

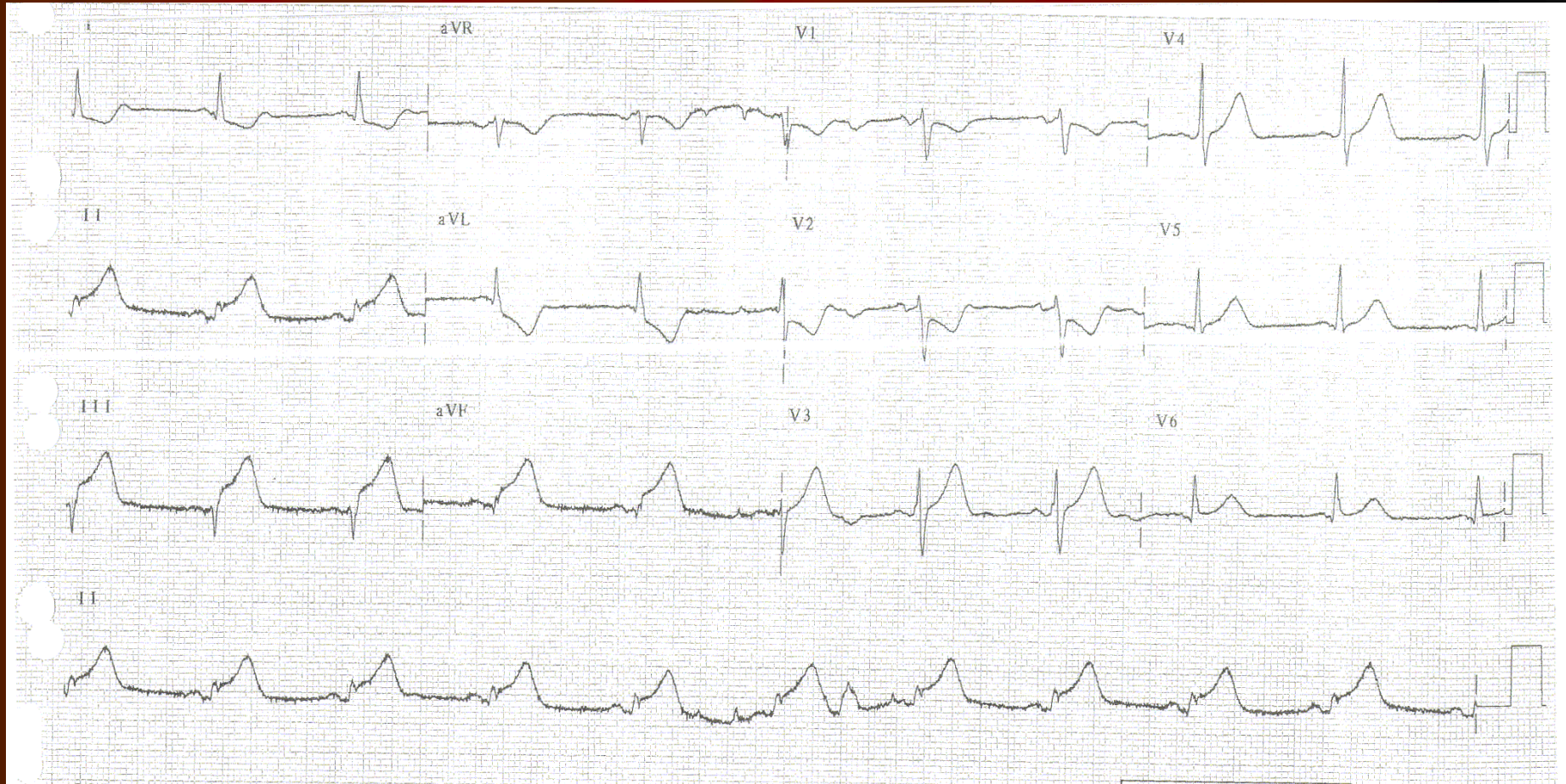
Circulation 2001;104:2632-2634.



Importance of Time to Treatment



58 y/o male with hx of CAD who presents with chest pain

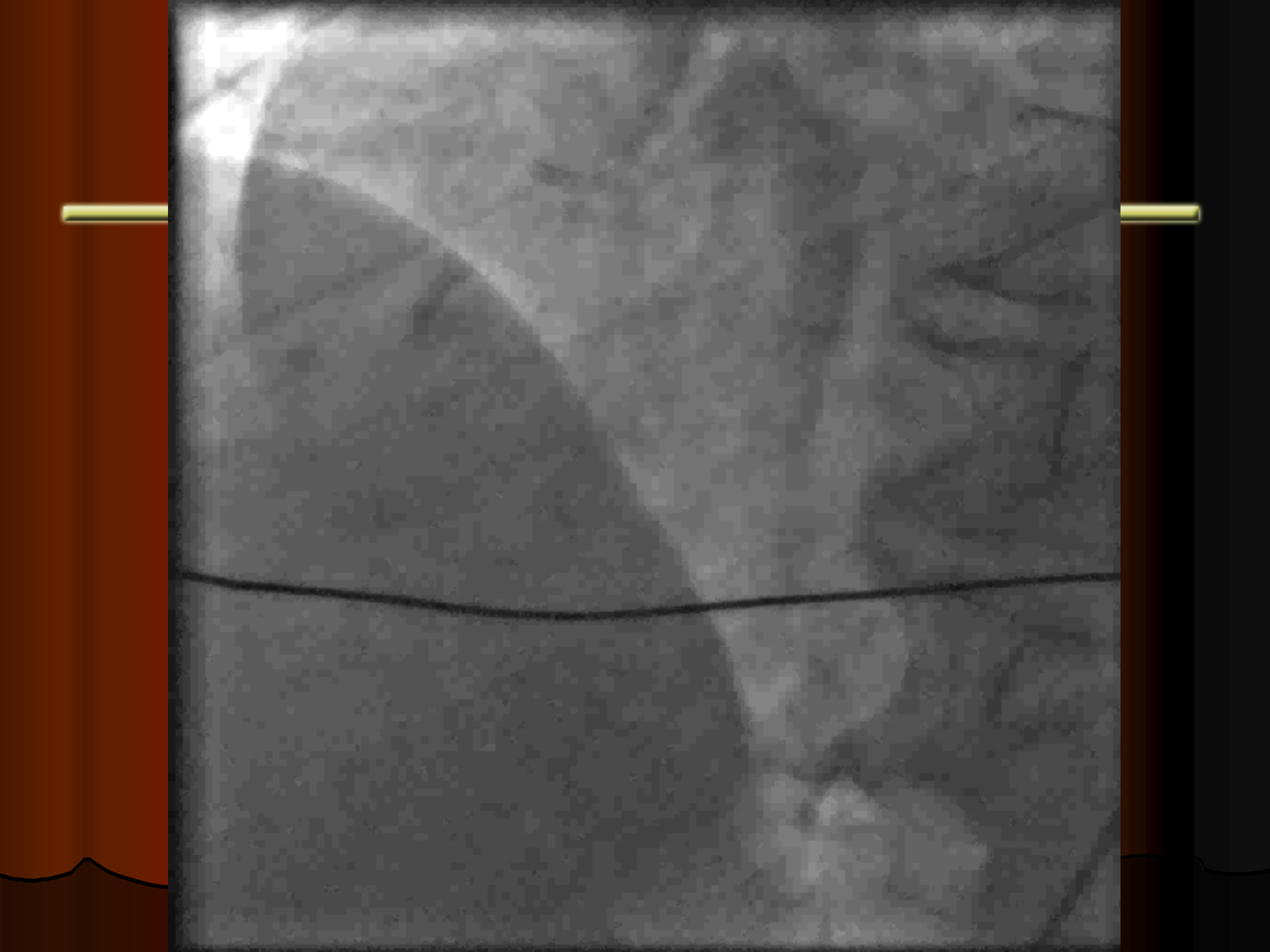


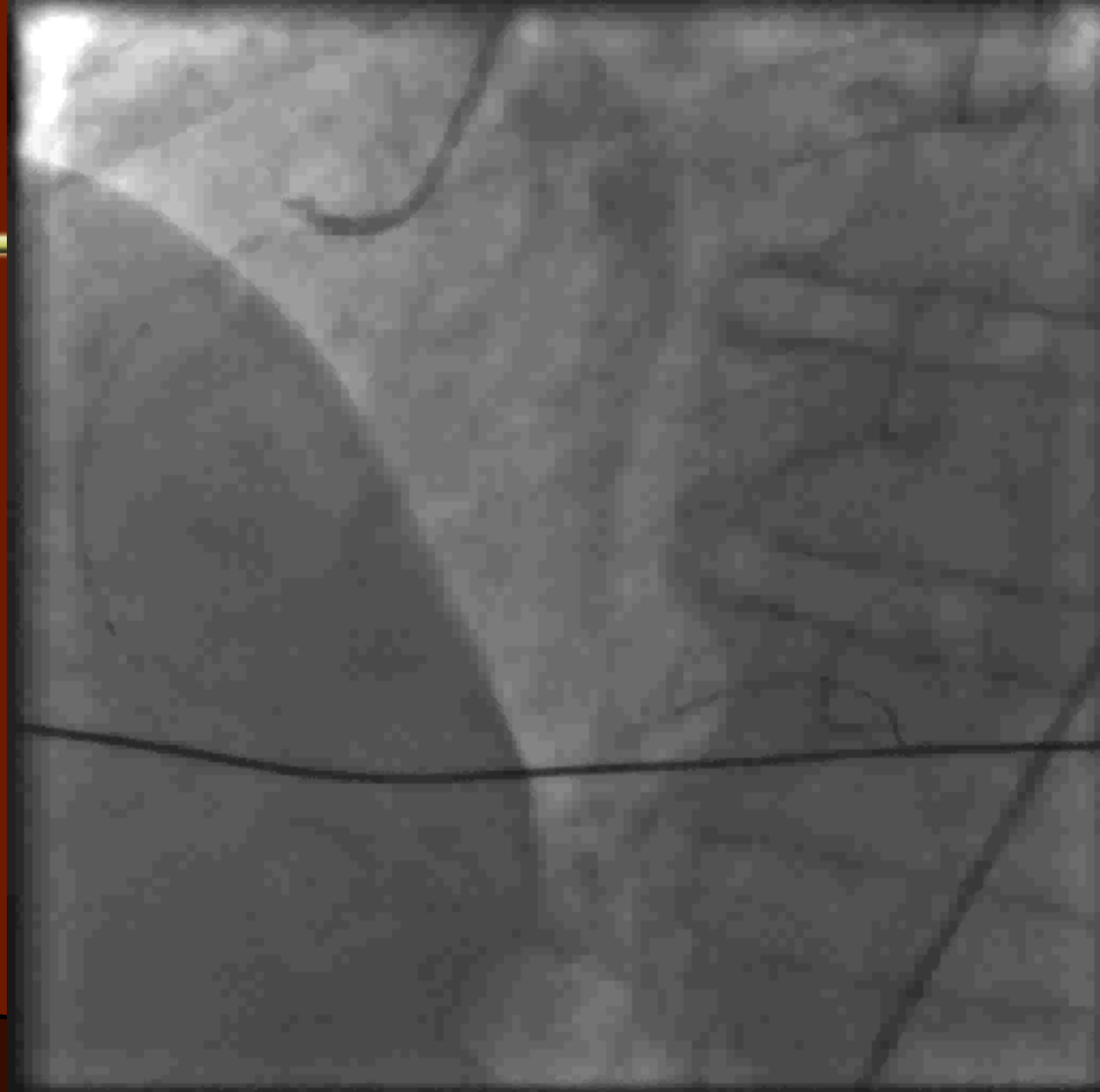
Improving D2B Times and Regional STEMI St. John's Mercy Heart Hospital, St. Louis

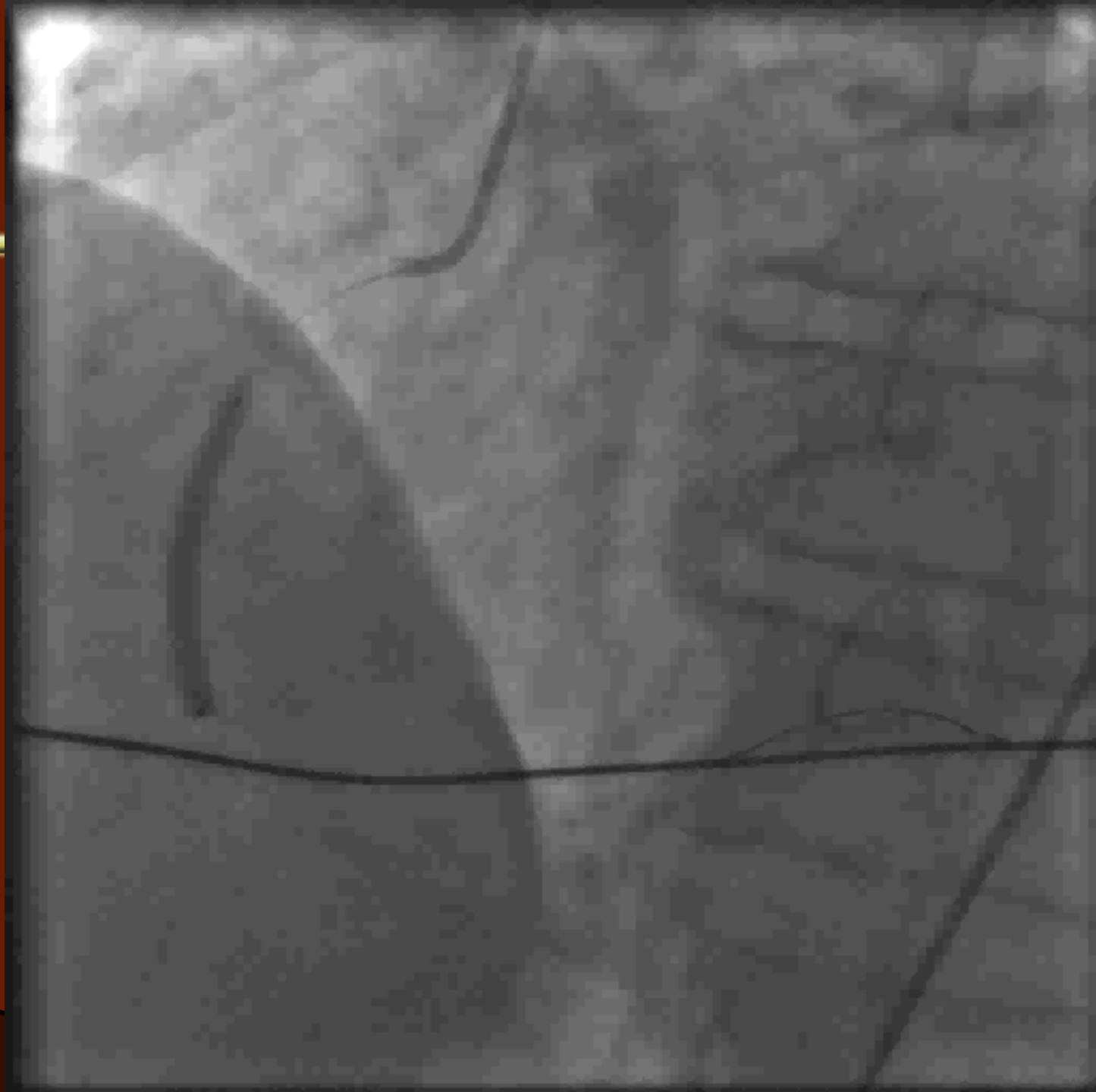


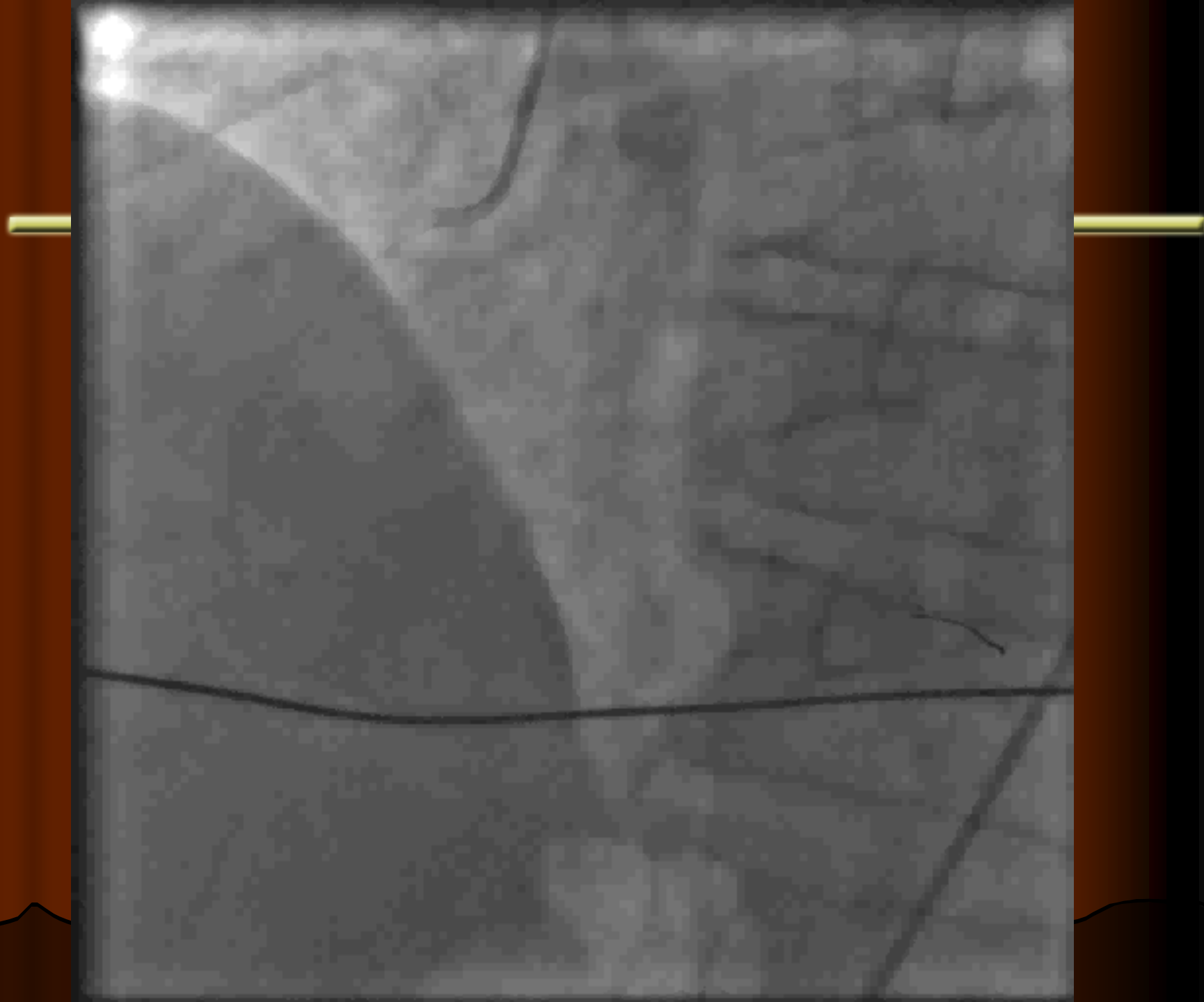
Video Introduction

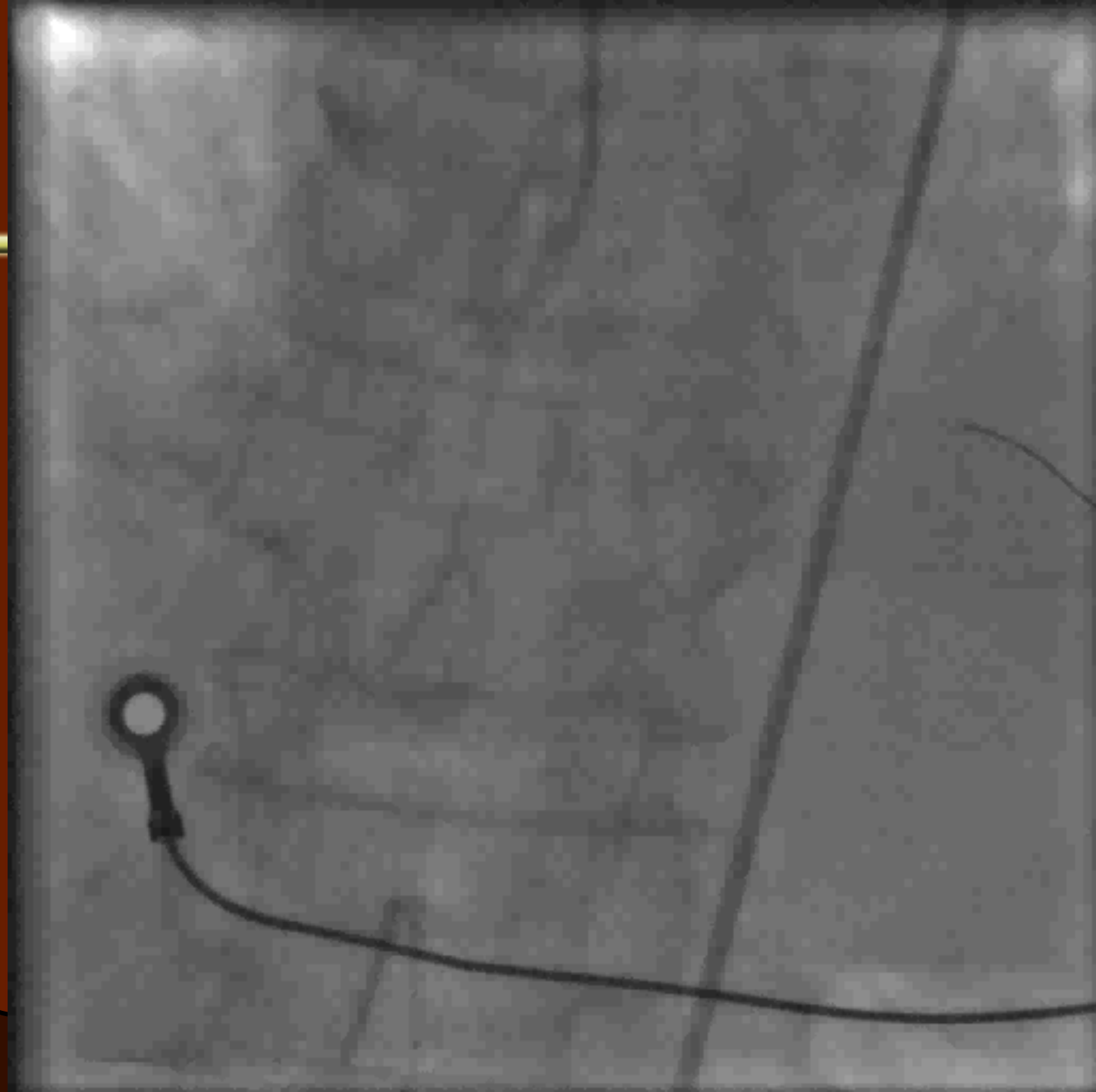


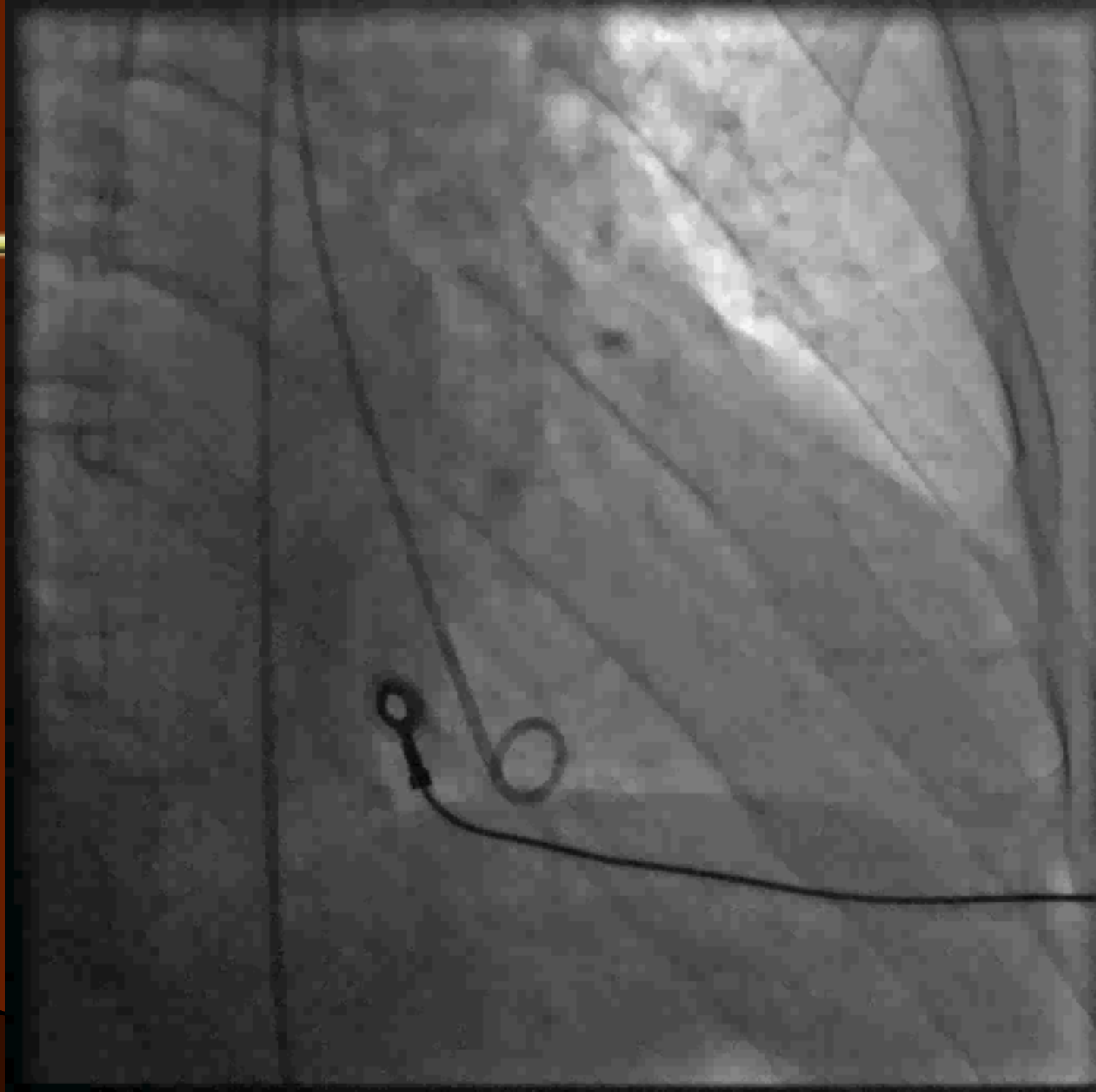












Treatment Delayed is Treatment Denied



**Symptom
Recognition**



**Call to
Medical System**



PreHospital



ED



Cath Lab

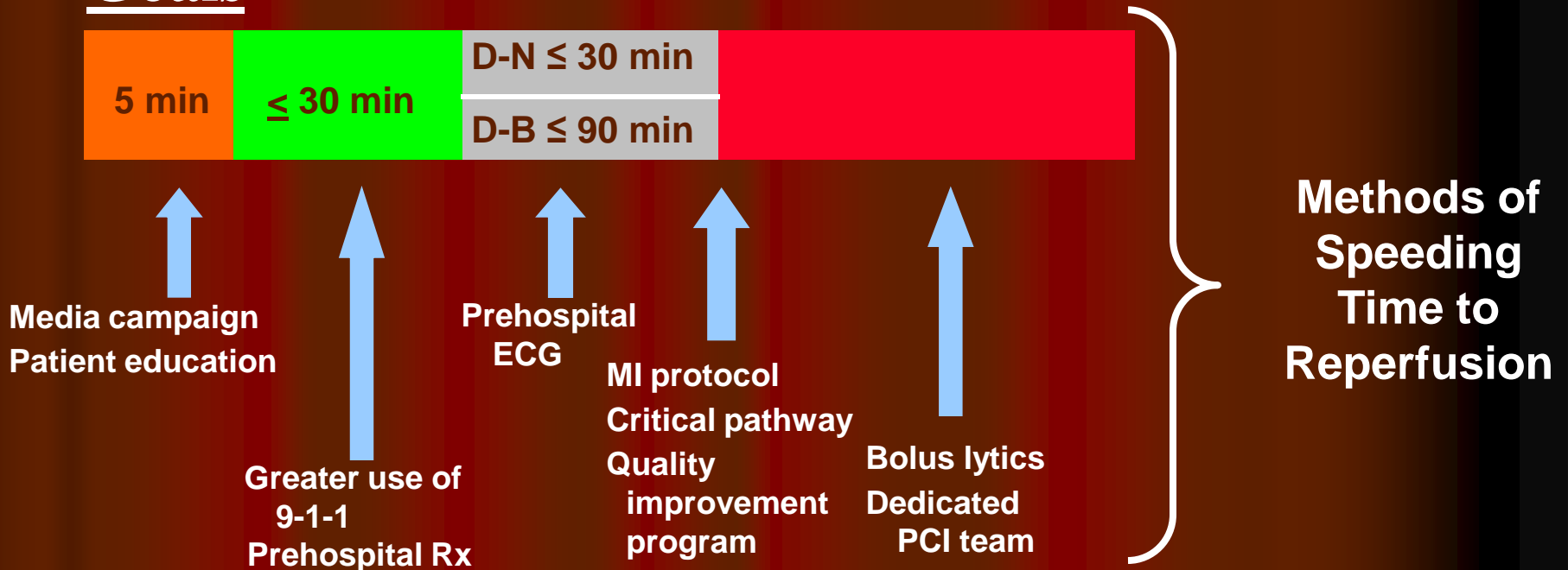
Increasing Loss of Myocytes

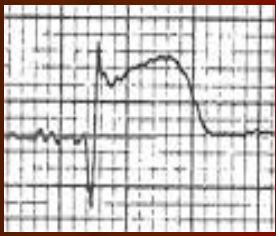
Delay in Initiation of Reperfusion Therapy

Reperfusion

■ Patient ■ Transport ■ Inhospital ■ Reperfusion

Goals





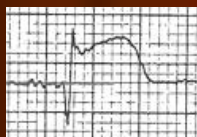
The Problem

Coronary heart disease (CHD) is the leading cause of death in the United States

Over 40% of myocardial infarctions occur in patients with no prior history of heart disease

Myocardial infarction or sudden cardiac death is the initial manifestation of CHD in over 33% of patients

Over 300,000 Medicare patients are hospitalized for heart attack (acute myocardial infarction) each year.



Acute Myocardial Infarction (AMI) in Missouri

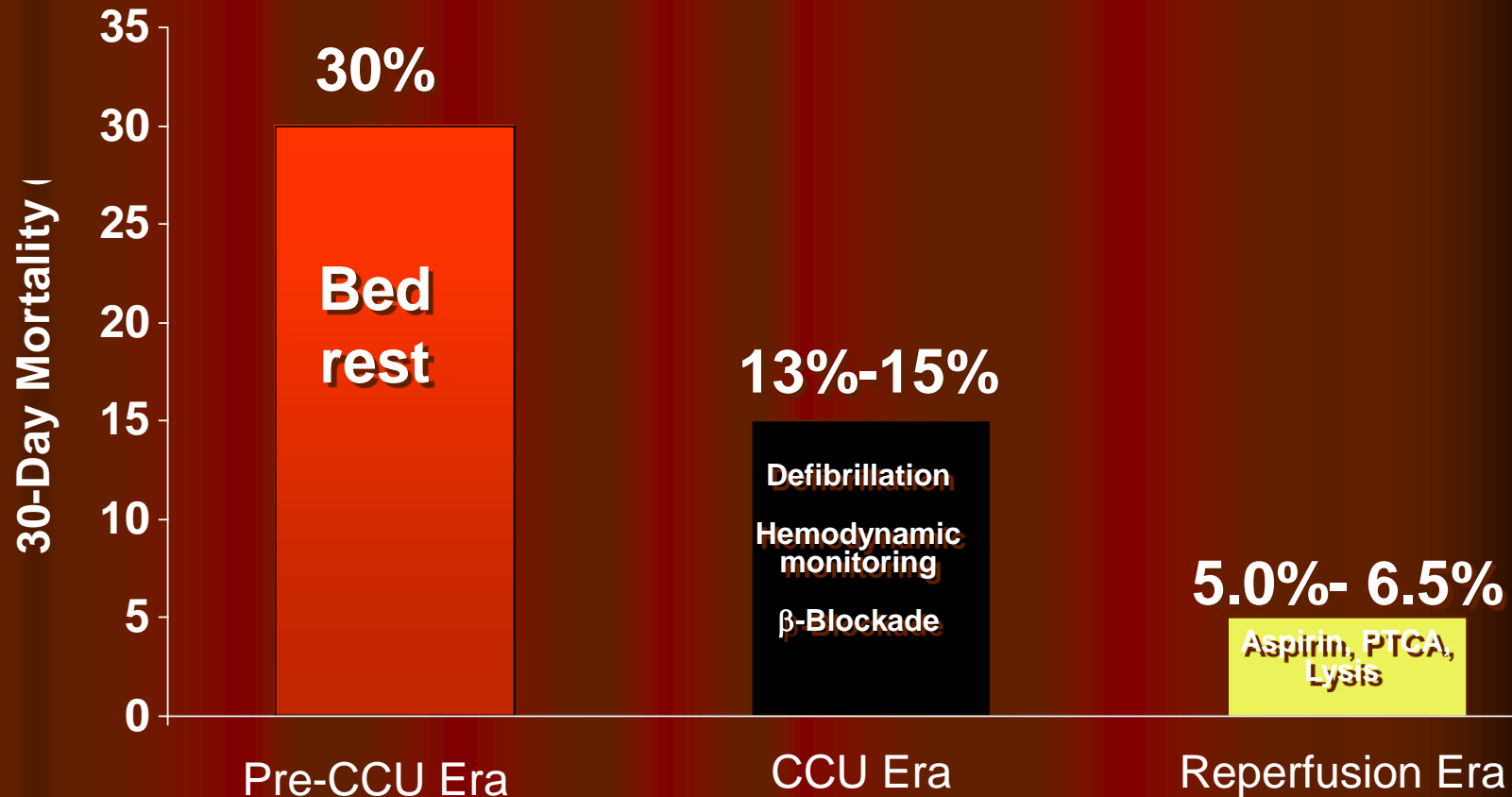
AMI is a leading cause of hospitalization and death among Medicare patients in Missouri.

In 1998 there were over 10,000 AMI inpatient stays in Missouri hospitals

26% of AMI patients are re-admitted within 90 days.

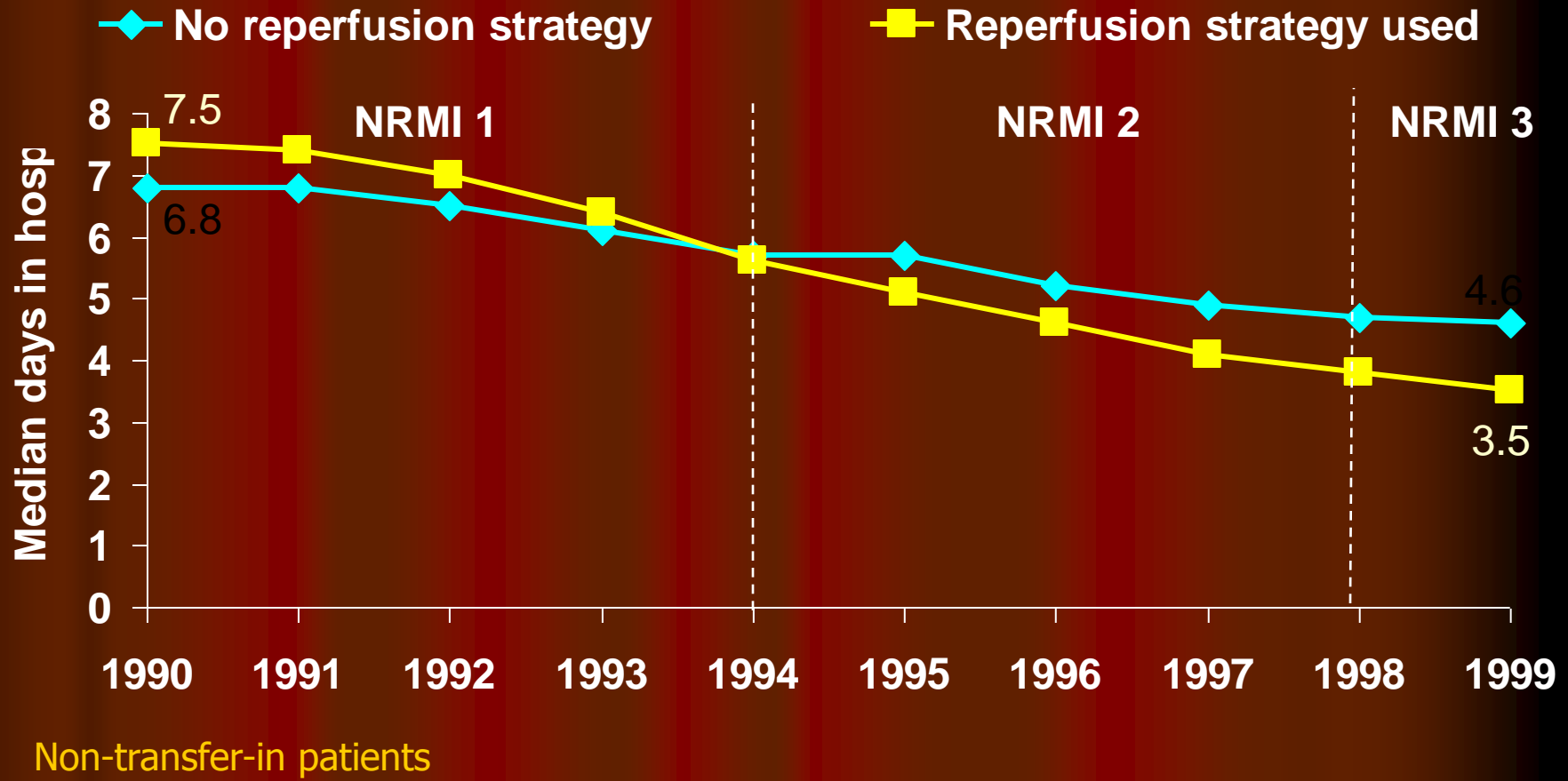
Mortality for this population = 26.7%.

Improvement in Mortality



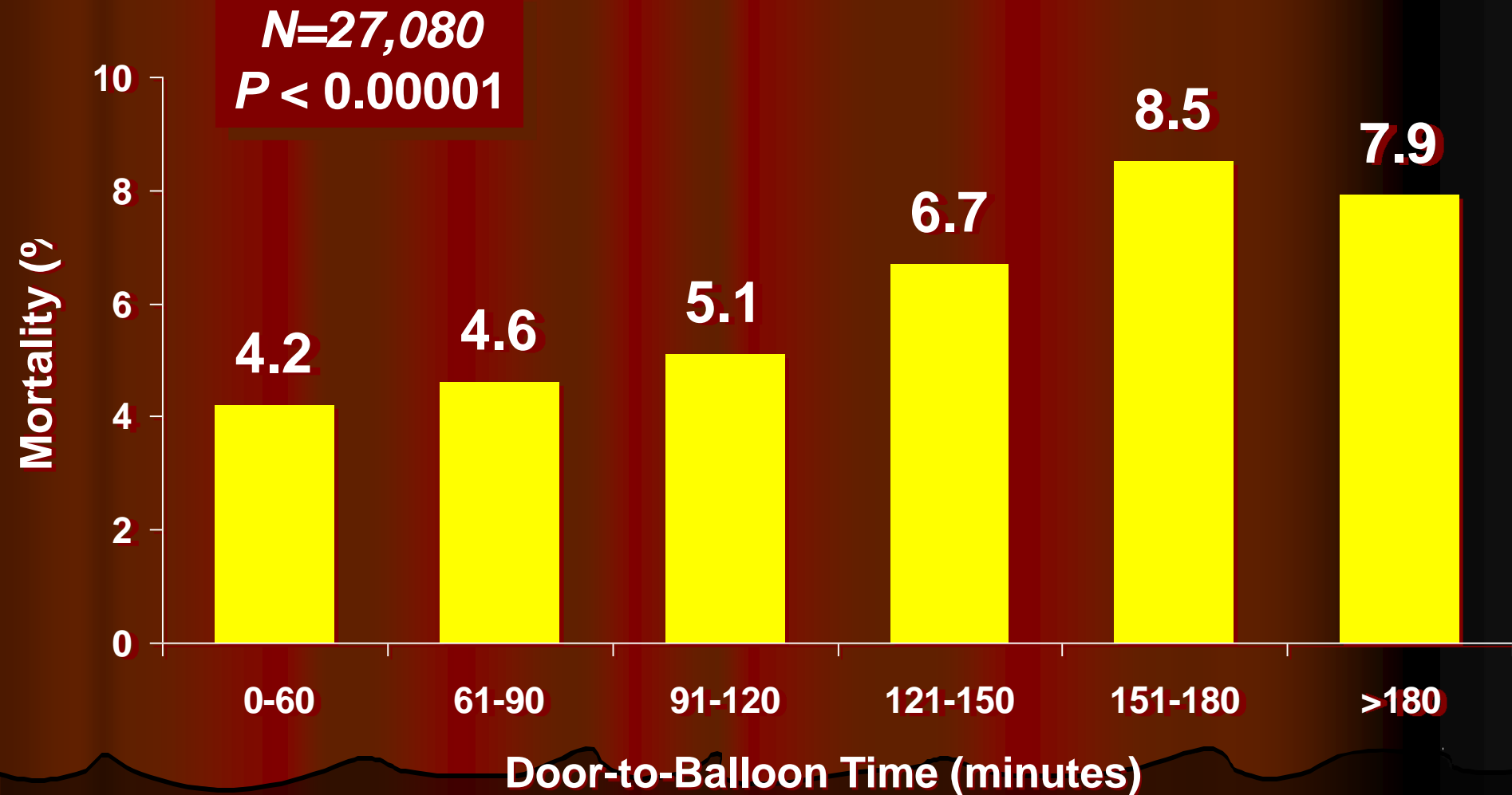
PTCA, percutaneous transluminal coronary angioplasty.

National Trends in AMI Management: Hospital Length of Stay

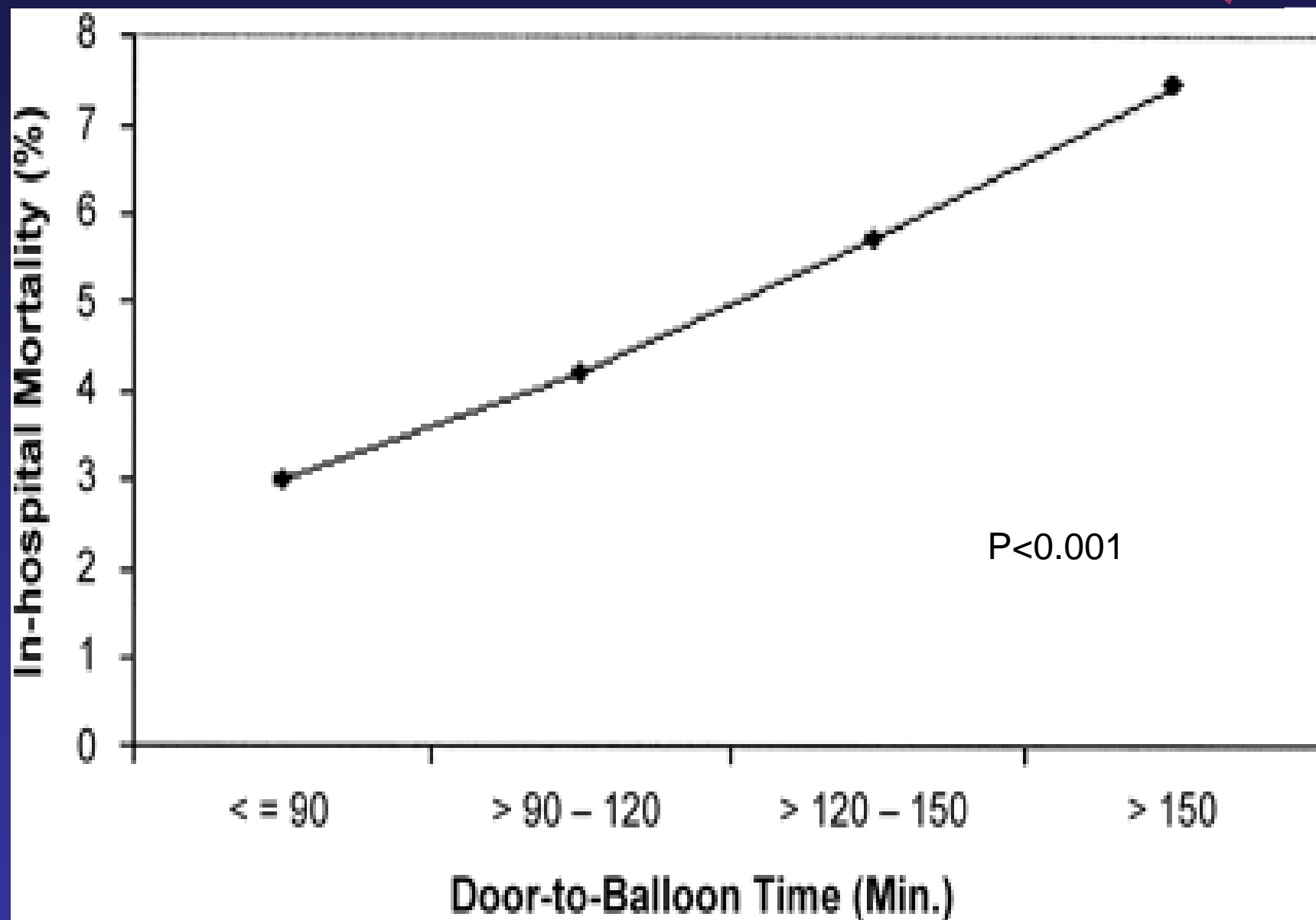


NRMI-2:

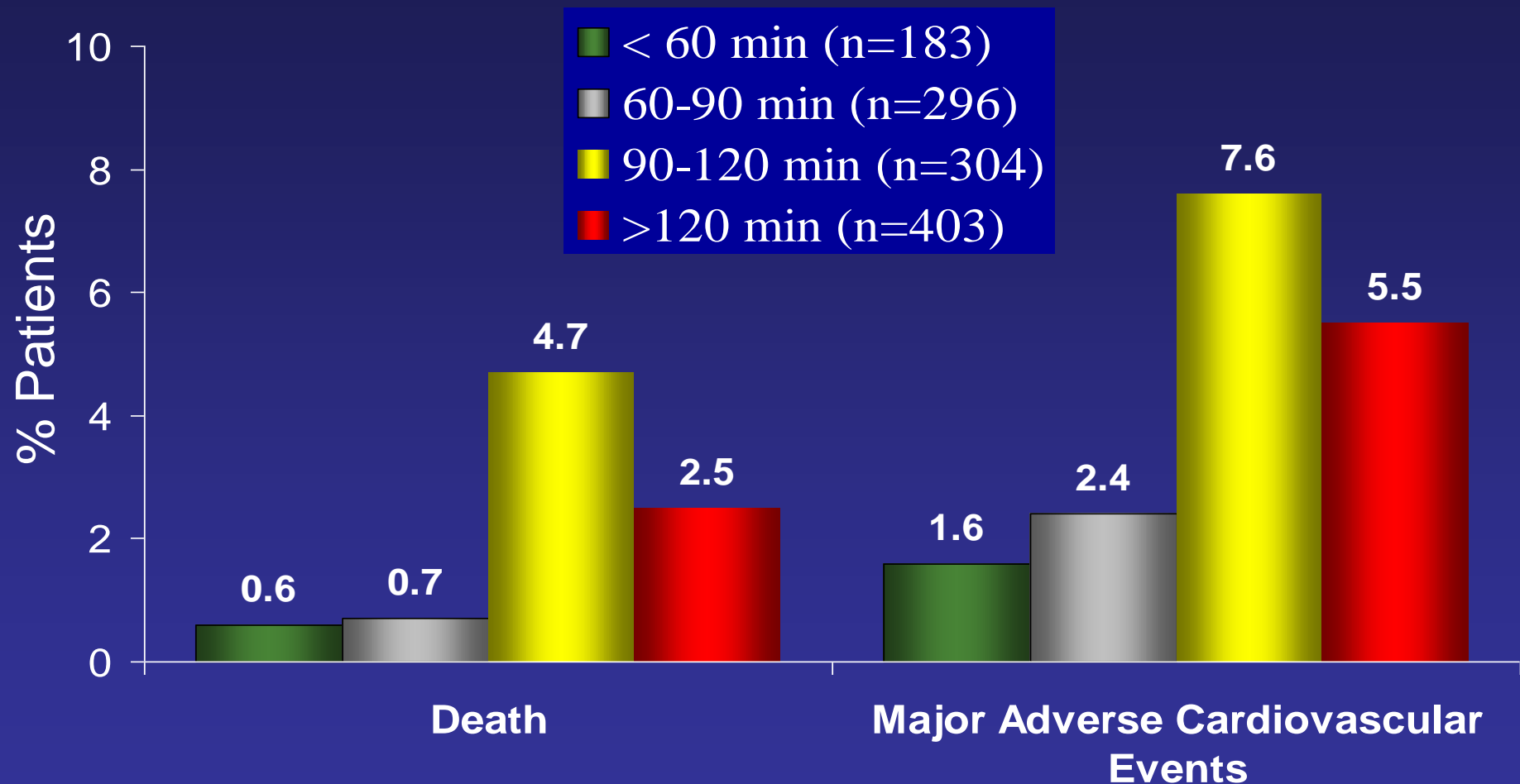
Primary PCI Door-to-Balloon time vs. Mortality



Door to Balloon Time and Mortality: NRMI 3/4

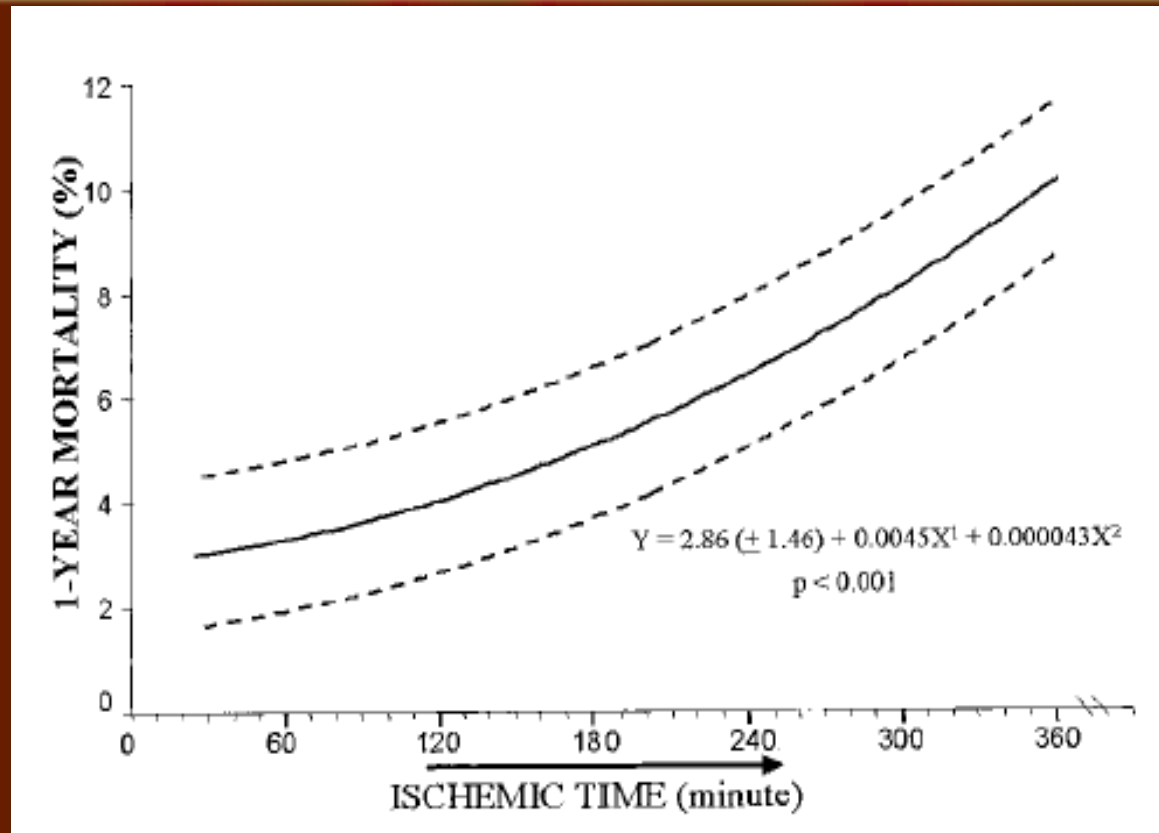


Clinical Outcomes to 30 Days Stratified by DTB Time: Pooled Analysis of Four Trials*



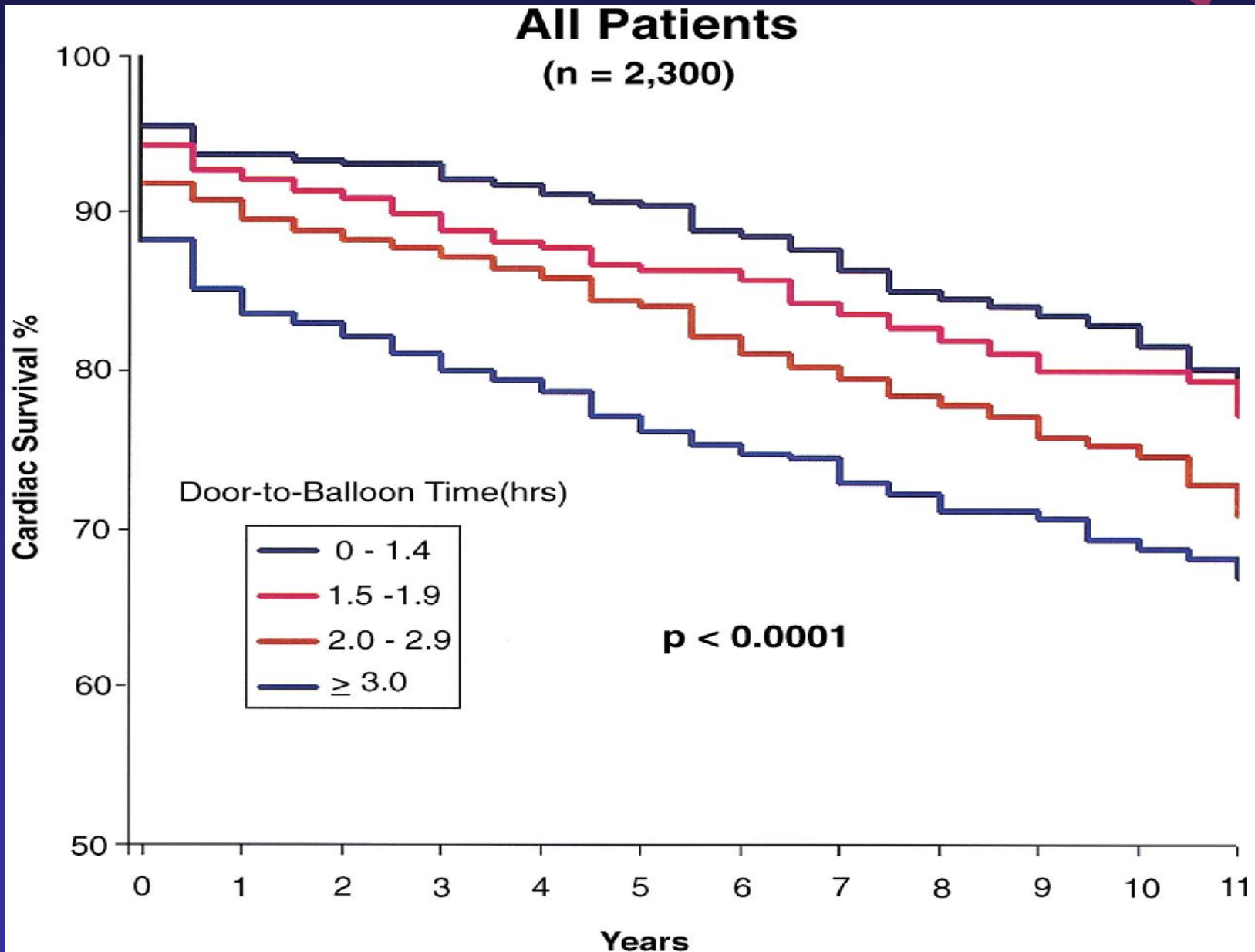
*EMERALD, COOL-MI, AMIHOT, ICE-IT Adapted from O'Neill W, et al. JACC 2005;45:225A

Time from Symptom Onset to Treatment Predicts 1-year Mortality after Primary PCI

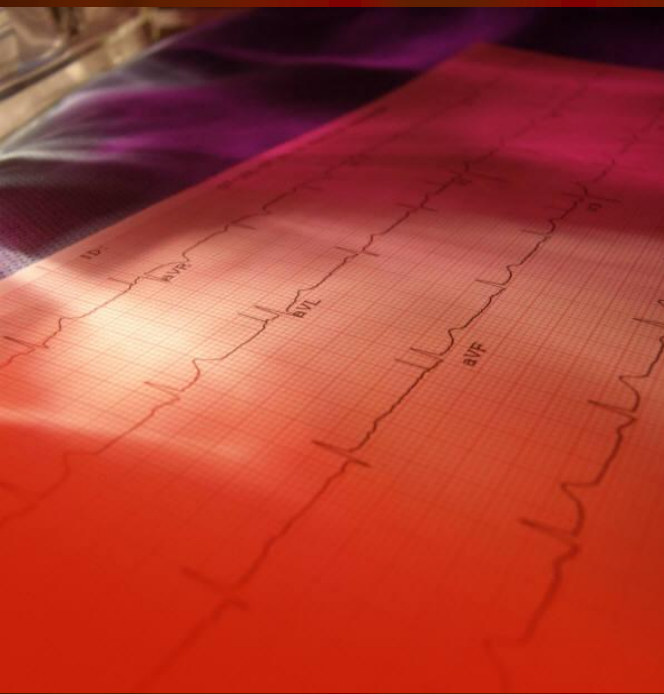


The relative risk of 1-year mortality increases by 7.5% for each 30-minute delay

Late Survival by Door-to-Balloon Time



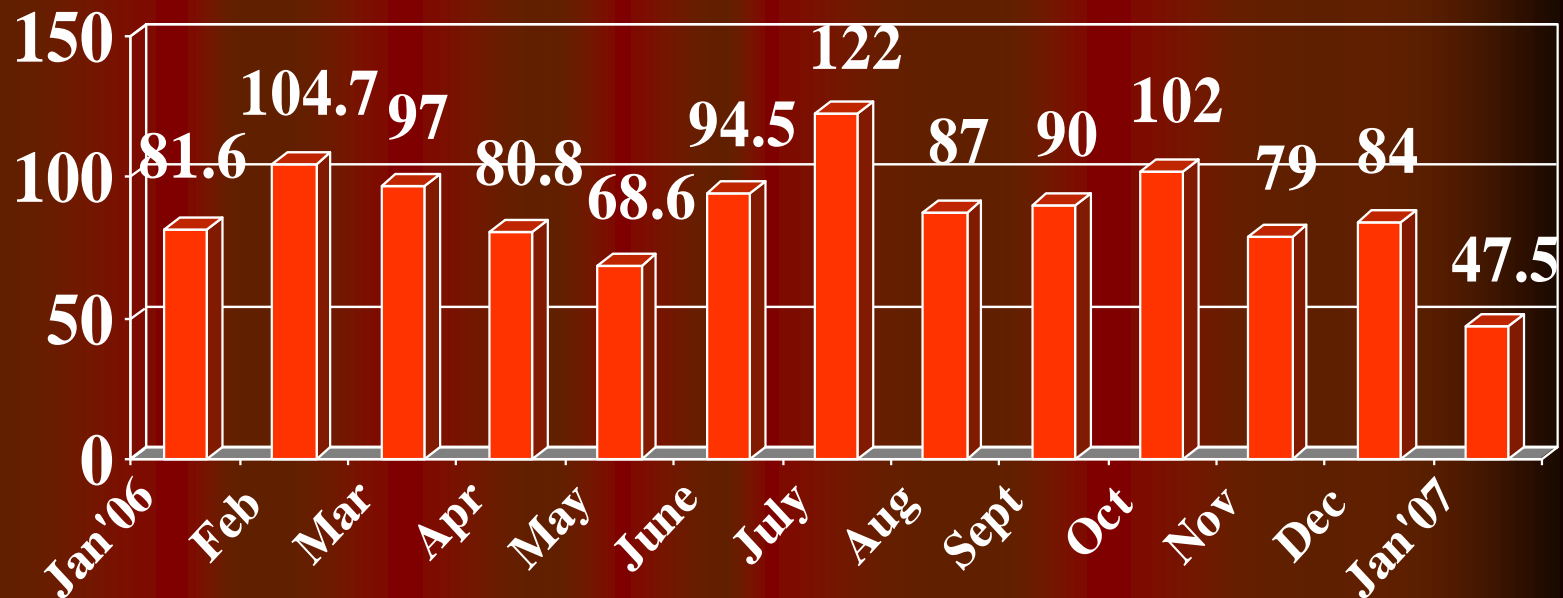
Our Aggressive Goal



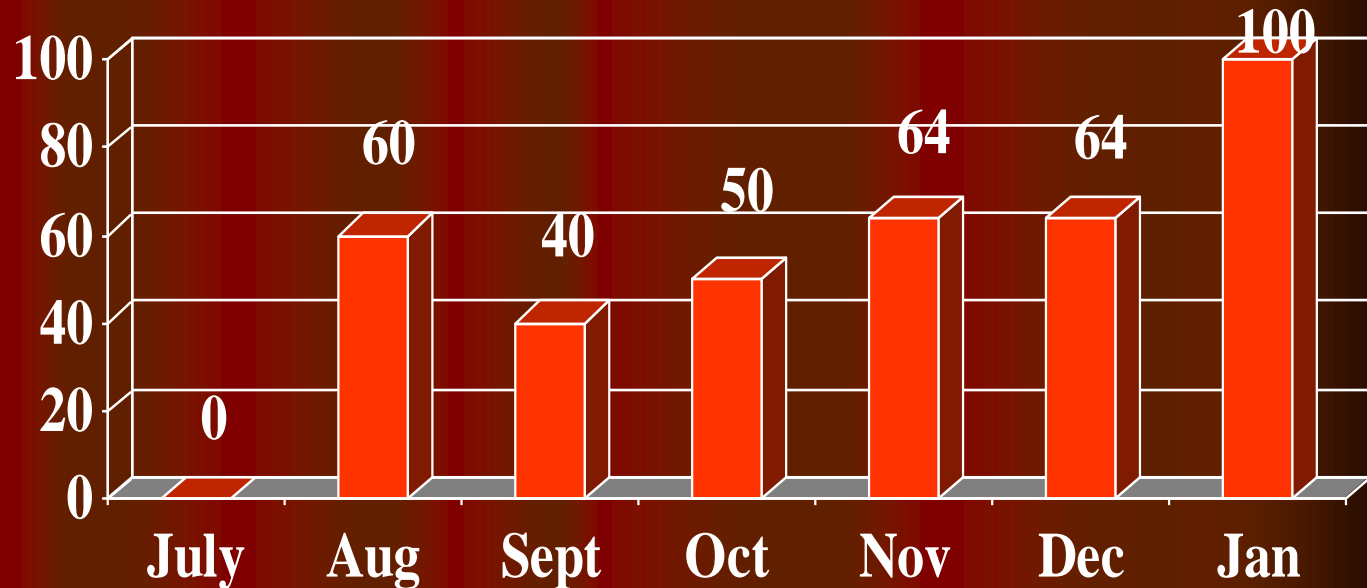
ED door to
balloon inflation
in the Cardiac Cath Lab in less
than **90** minutes

Mean Door to Balloon Time in Minutes

CMS / JCAHO expectation
changed to less than 90
min.



Hitting the goal



Percentage of times that SJMMC achieves goal of Door to Balloon in less than 90 minutes.
- data reflective CMS changes as of July 2006

Monday, November 13, 2006

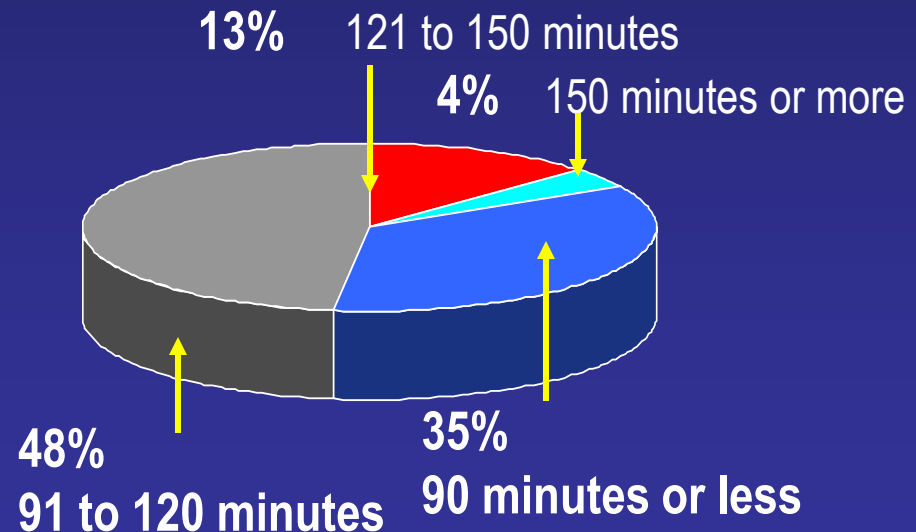
Hospitals too slow on heart attacks

Study finds only 35%
React quickly enough

By Steve Sternberg
USA TODAY

Beating the clock

Most hospitals fails to achieve
Optimum door-to-angioplasty
Times of 90 minutes or less



Source: New England Journal of Medicine



D2B: *An Alliance for Quality*

A Guidelines Applied in Practice (GAP) Program

ACC NEWS

President's Page:
GAP-D2B: An Alliance for Quality

Steven E. Nissen, MD, FACC

President, *American College of Cardiology*

John E. Brush, JR, MD, FACC

Harlan M. Krumholz, MD, FACC



D2B Goal



To achieve a door-to-balloon time of ≤ 90 minutes for at least 75% of non-transfer primary PCI patients with ST-segment elevation myocardial infarction in all participating hospitals performing primary PCI.

As of March 2007, over 800 centers signed up as participants.



Disseminating the “How”: Evidence- based Strategies

1. Pre-hospital ECG to activate the cath lab
2. ED physician activates the cath lab
3. One call activates the cath lab
4. Cath lab team ready in 20-30 minutes
5. Prompt data feedback
6. Senior management commitment
7. Team-based approach



Challenges/Limitations

- Delays are common
- Relationship with outcome strong
- Disparity is hospital-based
- Time of day/day of week important
- Specialization important
- Pre-hospital ECG rare



List of D2B Participating Hospitals in Missouri

Name	Hospital	Email	Phone	City
Richard Bach; Nelda Martin	Barnes-Jewish Hospital	rbach@im.wustl.edu ; nkm1535@bjc.org	314-362-7951	St. Louis
Sanjeev Ravipudi	Boone Hospital Center	sanjeevravipudi@hotmail.com	573-815-2209	Columbia
Al Hibbett	Christian Hospital	awh7885@bjc.org	314-653-5419	St. Louis
Celeste Mausolf	Des Peres Hospital	CELESTE.Mausolf@tenethealth.com	469-893-6776	St. Louis
Kerri Bogle	Freeman Health System	kdbogle@freemanhealth.com	417-347-6647	Joplin
Donna Ehler	Independence Regional Health Center	donna.ehler@hcamidwest.com	816-836-8100	Independence
Eric Hockstad	Lee's Summit Hospital	eshgoblue@sbcglobal.net	816-969-6133	Lee's Summit
Sandhya Vollala	Missouri Baptist Medical Center	svx4406@bjc.org	314-996-5054	St. Louis
Lynne Carlson	North Kansas City Hospital	lynne.carlson@nkch.org	816-691-5036	North Kansas City
Jami Ham	Poplar Bluff Regional Medical Center	jami.ham@pbrmc.hma-corp.com	573-785-7721	Poplar Bluff
Eric Hockstad; Nancy Engeman	Research Medical Center	eshgoblue@sbcglobal.net ; nancy.engeman@hcamidwest.com	816-276-4421	Kansas City
Lisa Riggs	Saint Luke's Mid-America Heart Inst.	lriggs@saint-lukes.org	816-932-6270	Kansas City
Cindy Bond	Southeast Missouri Hospital	cinbond@sehosp.org	573-334-4822	Cape Girardeau
George Kichura; Mary Burton	St. Johns Mercy Medical Center	heartsfive@aol.com ; burtmc@stlo.mercy.net	314-251-1700	St. Louis
Kimberly Perry	St. Joseph Health Center	kimberly_perry_do@ssmhc.com	636-947-5000	St. Charles
Jane Falk	St. Joseph Medical Center	janefalk@carondelet.com	816-943-2732	Kansas City
Celeste Mausolf	St. Louis University	CELESTE.Mausolf@tenethealth.com	469-893-6776	St. Louis
Lindy Huff	St. Luke's Hospital	lindy.huff@stlukes-stl.com	314-434-1500	Chesterfield
Mike Lambert	University of Missouri	lambertm@missouri.edu	573-882-8504	Columbia



Recommended Strategy	% of D2B Hospitals Meeting Recommended Strategy in MO	% of D2B Hospitals Meeting Recommended Strategy Nationally
ED physician activates the cath lab	77%	51%
Single-call activation system activates the cath lab	50%	30%
Cath lab team available within 20 – 30 minutes	100%	81%
Prompt data feedback (within 1 week)	46%	57%
(Optional) Pre-hospital ECG activates the cath lab	56%	49%



**Improving the System of Care for STEMI
Patients**



What is Mission: Lifeline?

National initiative to improve quality of care and outcomes in heart attack patients by improving the health care system readiness and response to ST-elevated myocardial infarction (STEMI) patients.



STEMI Systems of Care Recommendations

<http://circ.ahajournals.org/current.shtml>



State of the System

- Approximately 30% of STEMI patients do not receive any reperfusion therapy (whether by PCI or clot busting drugs)
- Up to 20% of STEMI patients are not eligible for fibrinolytic therapy, yet 70% of these patients do not receive primary PCI

State of the System

One of the biggest challenges in developing an ideal system of care for STEMI patients, is the inadequate recognition by patients and bystanders of acute MI symptoms and the urgency of activating EMS and calling 911.



State of the System

Only a minority of EMS vehicles nationwide are equipped with 12-lead ECGs and there is little information on how these ECGs are integrated into the system of care for STEMI patients





State of the System

The current process for triaging, evaluating and treating a suspected STEMI patient who presents to the emergency department includes a large number of potentially avoidable delays.



State of the System

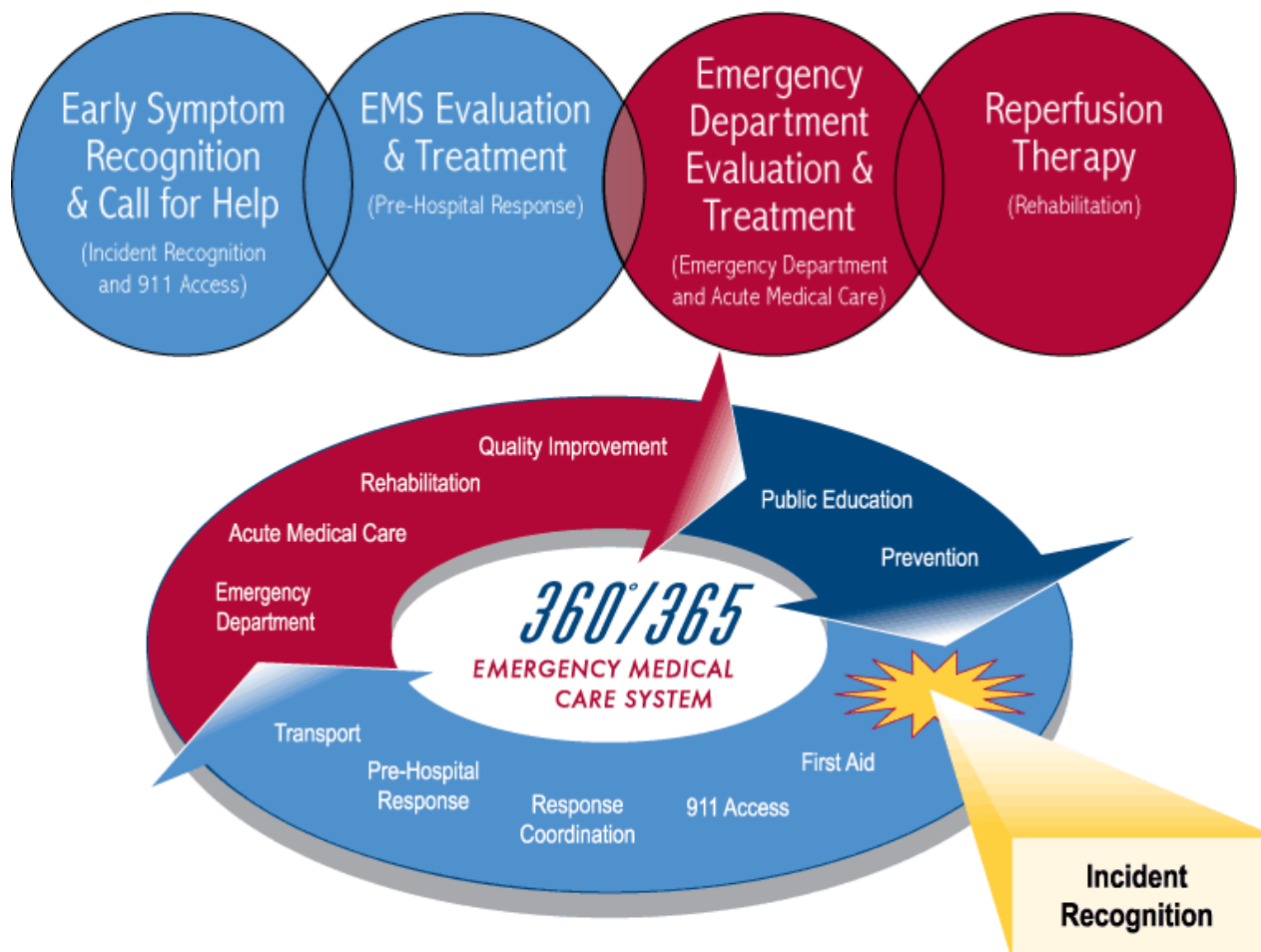
Only a minority of hospitals are PCI-capable so STEMI patients presenting to these hospitals are in need of primary PCI must be transferred to another Facility.

State of the System

Currently, primary care and specialist physicians tend to work separately rather than in integrated networks in caring for patients with STEMI, particularly at entry into the medical system.



The STEMI Chain of Survival





Reperfusion in AMI in Carolina Emergency Departments



A Systems Approach To Improve Survival of Patients
with Myocardial Infarction In North Carolina Through
Improved Application of Reperfusion Therapy

STEMI System

BOSTON

- In the field ECG
- Diversion of STEMI to closest PCI hospital
- Hospitals will never be on diversion for ST-elevation MI (similar to trauma center plan)
- Each hospital will perform a minimum of 36 primary PCI or rescue PCI procedures / year
- PCI will be performed within 120 minutes of hospital arrival (ie, door-to-balloon time of 120 minutes) in 75% of “ideal” patients

Strategies and Door-to-Balloon Time Saved

- **ED physicians activate the cath lab (8.2 minutes)**
- **Single call to a central page operator activate the lab (13.8 minutes)**
- **ED activate the cath lab while the patient is en route to the hospital (15.4 minutes)**
- **Expecting staff to arrive in the cath lab within 20 minutes after being paged (vs. >30 minutes) (19.3 minutes)**
- **Attending cardiologist always on site (14.6 minutes)**
- **Having staff in the ED and the cath lab use real-time data feedback (8.6 minutes)**

Door-to-Balloon Time According to the Number of Key Strategies Used

Table 4. Door-to-Balloon Time According to the Number of Key Strategies Used.*

Number of Key Strategies	Hospitals with the Number of Key Strategies (N=362)	Average of Median Door-to-Balloon Times†
	<i>no. (%)</i>	<i>minutes</i>
0	137 (37.8)	110
1	130 (35.9)	100
2	56 (15.5)	88
3	31 (8.6)	88
4	8 (2.2)	79

* Since the number of hospitals using three or four strategies was small, the precision of the estimates may be limited.

† P<0.001.



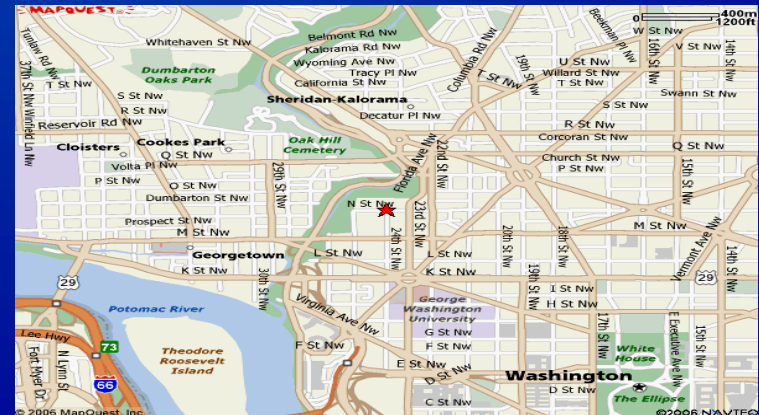
Top Ten List

10. Use local ambulance to transport pts (within ~50 miles)
9. Keep patient on local ambulance stretcher
8. Give heparin bolus (70 U/kg) and no IV infusion
7. Establish protocol for lytics vs PCI for each ED
6. Establish single call number to PCI centers that "automatically" activates cath lab
5. Provide standardized feedback reports
4. System for rapid triage of walk-ins, rapid ECGs
3. Prehospital ECGs for all CP pts (and ED use them!)
2. "Certify" all EMTs/paramedics to read ST \uparrow on ECGs, immediately activate reperfusion (lytics or cath lab)
1. Create EMS, ED, cardiology team with committed leadership

Emergency Cardiovascular Care 2007: Building Regional Integrated STEMI Systems for Reperfusion

ACC Sponsored Meeting with goal to
teach and enable teams to establish
effective regional STEMI
reperfusion systems

June 1-2, 2007, Washington, DC



Regional STEMI Networks in Southern California Reduce Door-to-Balloon Times: Pooled Data from 4 Counties

Ivan Rokos, MD FACEP

On behalf of the

**Southern California STEMI
Consortium**

October 22, 2007 at TCT.07

Background

- **ACC D2B Alliance (November, 2006)**
 - Goal is $\geq 75\%$ rate of D2B ≤ 90 Minutes
 - 6 Core Strategies
 - Optional: Pre-hospital ECG to activate the CCL
- **AHA Mission: Lifeline (May, 2007)**

Rationale

Rationale for establishing regional ST-elevation myocardial infarction receiving center (SRC) networks

Ivan C. Rokos, MD,^a David M. Larson, MD,^b Timothy D. Henry, MD,^c William J. Koenig, MD,^d Marc Eckstein, MD,^e William J. French, MD,^f Christopher B. Granger, MD,^g and Matthew T. Roe, MD, MHS^h *Los Angeles, CA; Waconia and Minneapolis, MN; and Durham, NC*

Recent developments have provided a unique opportunity for the organization of regional ST-elevation myocardial infarction (STEMI) receiving center (SRC) networks. Because cumulative evidence has demonstrated that rapid primary percutaneous coronary intervention (PCI) is the most effective reperfusion strategy for acute STEMI, the development of integrated SRC networks could extend the benefits of primary PCI to a much larger segment of the US population. Factors that favor the development of regional SRC networks include results from recently published clinical trials, insight into contemporary STEMI treatment patterns from observational registries, experience with the nation's current trauma system, and technological advances. In addition, the 2004 American College of Cardiology/American Heart Association STEMI guidelines have specified that optimal "first medical contact-to-balloon" times should be <90 minutes, so a clear benchmark for timely reperfusion has been established. Achievement of this benchmark will require improvements in the current process of care as well as increased multidisciplinary cooperation between emergency medical services, emergency medicine physicians, and cardiologists. Two types of regional SRC networks have already begun to evolve in role-model cities, including prehospital cardiac triage and interhospital transfer. Regional coordination of SRC networks is needed to ensure quality monitoring and to delineate the ideal reperfusion strategy for a given community based on available resources and expertise. (Am Heart J 2006;152:661-7.)

Two types of STEMI Regionalization

Pre-hospital Cardiac Triage (PCT)

- EMS identifies STEMI & transports directly to PCI capable hospital
- Similar to nation's current trauma system: *sick pts = special care*

Inter-Hospital Transfer (IHT)

- Spoke hospital identifies STEMI & transfers immediately to PCI capable hospital
- *Henry et al, Minneapolis, Circulation August, 2007*
- *Ting et al, Mayo Program, Circulation August, 2007*

Limitations

- No comprehensive baseline data on rate of D2B \leq 90 minute in Southern California
- **No resources for auditing source data**
- Database variation across 4-counties
 - Tracking pre-hospital ECG time
 - Tracking PH-ECG+ patients without PCI
- **No clinical outcomes data reported**

Conclusions

Regional STEMI Networks

- **85% rate of D2B** ≤ 90 minutes (N =699) across 4 counties in Southern California
 - A metro region with 16.8 million citizens
 - 52 designated STEMI Receiving Centers
 - Pre-hospital Cardiac Triage focus
- SRC networks exceed the **D2B Alliance** benchmark of 75% rate of D2B ≤ 90 minutes
- **71% rate of E2B** ≤ 90 minutes (N=331)

Editorial

Regionalized Care for Patients with ST-Elevation Myocardial Infarction It's Closer Than You Think

Alice K. Jacobs, MD



Questions

